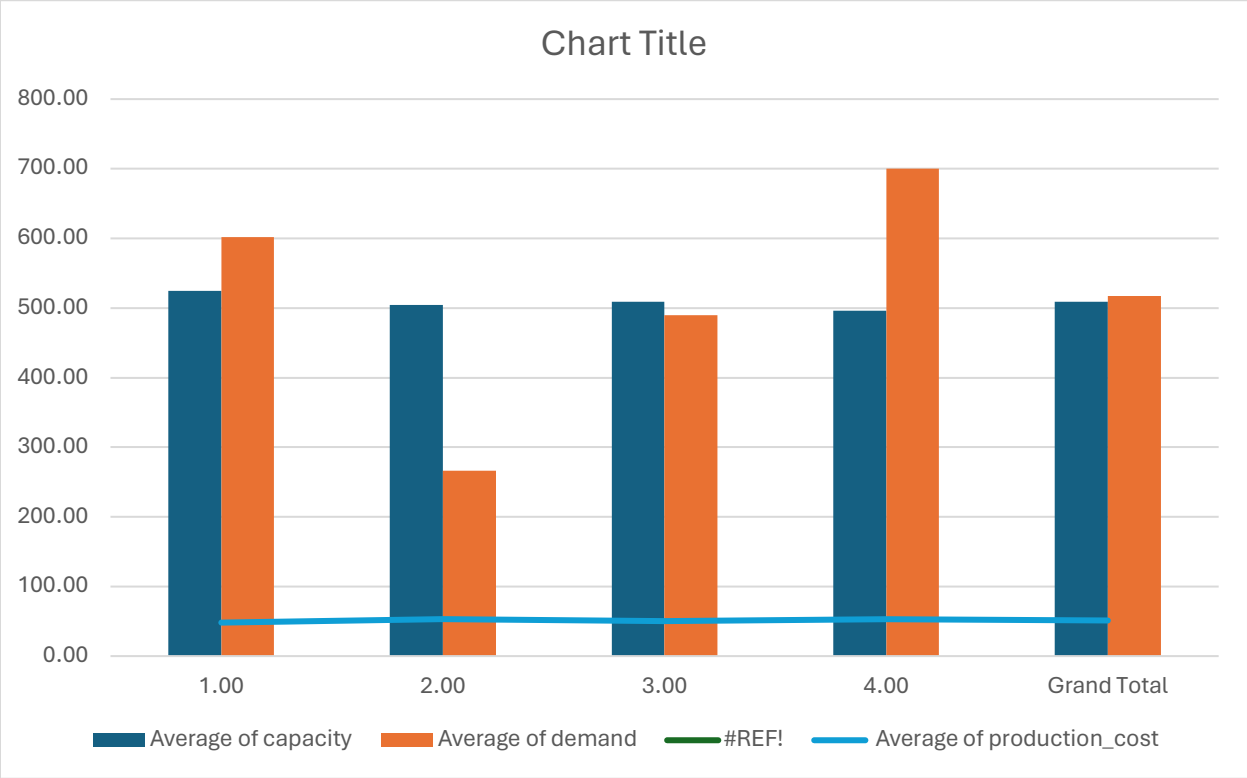
Module 03 – Production Modeling

Exploratory Data Analysis

Row Labels	Average of capacity	Average of demand	Average of Safety Stock	Average of production cost
1.00	524.37	601.64	60.16	$ 48.11
2.00	504.68	266.20	26.62	$ 53.12
3.00	508.99	489.71	48.97	$ 49.85
4.00	496.08	700.10	70.01	$ 52.86
Grand Total	**508.57**	**517.14**	**51.71**	**$ 50.96**



Model Formulation

Min:

48.11P1 + 53.12P2 + 49.85P3 + 52.86P4 + 1.48 (B1+B2)/2 +1.48 (B2+B3)/2 +1.48 (B3+B4)/2

Constraints:

P1 <= 524.37
P2 <= 504.68
P3 <= 508.99
P4 <= 496.08

B1+P1 >= 60.16
B2+P2 >= 26.62
B3+P3 >= 48.97
B4+P4 >= 70.01

B2= B1+P1-524
B3= B2+P2-398
B4= B3+P3-509
B5= B4+P4-496

Objective Function:

Monthly Production Cost (MPC) Monthly Carrying Cost (MCC)

MPC1 + MPC2+ MPC3+ MPC4+MCC1 + MCC2 + MCC3 +MCC4

Model Optimized for Cost Reduction

Quarter	1	2	3	4		
Beginning Inventory	200	123	255	274		
Units Produced	524	398	509	496		
Units Demanded	601.64	266.20	489.71	700.10		
Ending Inventory	123	255	274	70		
MIN Inventory (Safety Stock)	60.16	26.62	48.97	70.01		
MAX Production (Production capacity)	524.37	504.68	508.99	496.08		
Average Inventory	161	189	264	172		
Unit Production Cost	$48.11	$53.12	$49.85	$52.86		
Unit Carrying Cost	$1.48	$1.48	$1.48	$1.48		
Monthly Production Cost	$25,225	$21,155	$25,372	$26,224		
Monthly Carrying Cost	$776	$589	$753	$734		
					Total Cost	$100,829

Within the model, we can find constraints put in place to find the minimum cost needed to produce the maximum of products to reach demand. In this model we used the constraints above to make sure all units produced in each quarter meet the safety stock requirements along with fitting into the maximum production capacity. The unit product and carrying cost are listed per quarter. The minimum cost, with the aligning units produced, is $100,829. This model helps accurately display the carrying costs for the products, and the inventory levels that the company will he holding to make sure there is efficiency within the production line according to demand.

Model with Stipulation

Quarter	1	2	3	4		
Beginning Inventory	200	1,526	1,260	770		
Units Produced	1,928	0	0	0		
Units Demanded	601.64	266.20	489.71	700.10		
Ending Inventory	1,526	1,260	770	70		
MIN Inventory (Safety Stock)	60.16	26.62	48.97	70.01		
MAX Production (Production capacity)	524.37	504.68	508.99	496.08		
Average Inventory	863	1,393	1,015	420		
Unit Production Cost	$48.11	$53.12	$49.85	$52.86		
Unit Carrying Cost	$0.00	$0.00	$0.00	$0.00		
Monthly Production Cost	$92,731	$0	$0	$0		
Monthly Carrying Cost	$0	$0	$0	$0		
					Total Cost	$92,731

Without a production capacity constraint, we can see that the cost of production drops significantly through the four quarters, with a cost of $92,731. Because there is no constraint, the company can produce all the units needed within the first quarter. With the removed carrying cost, the company does not need to pay and holding costs for the safety stock and holding all the units produced in the first quarter. There are many fallbacks to this model because if the demand were to drastically change without any knowledge of the company, they might have a difficult time producing more products and/or having too many products. This did match my expectations that it would lower the cost for the company, but I believe this process can include more risk.